

Remarks

This amendment is responsive to the official action of Paper No. 9, in which claims 1-5 and 7-10 were rejected as anticipated by US 6,417,784 – Hilliard et al., and allowable subject matter was indicated as to claims 6 and 11.

Claims 6 and 11 have been placed in independent form, including the subject matter of the base claim and intervening claims. These claims are allowable in accordance with the official action.

Claim 1 has been amended to incorporate former claims 1 and 2. Claim 4 now incorporates former claims 1 and 4. Claims 2 and 3 have been canceled. The total number of claims is reduced. The number of independent claims is increased to four. The fee for presentation of an independent claim over three (\$43.00) is included.

No new matter is presented. The claims as amended are believed to be allowable as amended. Reconsideration and allowance are requested.

The claimed invention concerns a vehicle detection and classifying apparatus in which an electrically conductive coil is disposed in a plane that is perpendicular to the plane of the roadway carrying the vehicle to be detected, such that the axis of the coil is parallel to the surface of the roadway.

The Hilliard patent is cited as an anticipation of claims 1-5 and 7-10 as previously amended, and teaches a number of different coil orientations. These include orientations in which the coil is in a plane conventionally parallel to the road surface and the coil axis is vertical (Figs. 1a, 1b in Hilliard) and also a preferred embodiment wherein a so-called "blade-type" wire loop configuration is used. In the blade configuration, the coil is wound or plated onto a form, typically plastic, and inserted into a slot that is cut vertically into the road surface with a saw, such that the plane of the wire loop is oriented substantially perpendicular to the plane of the pavement, instead of parallel to the plane of the pavement. See col. 6, lines 37-52.

In order to better distinguish from Hilliard, applicant has amended the rejected claims to state that the loop is arranged substantially in a plane perpendicular to the road surface such that the axis of the loop extends substantially parallel to the road surface, and the plane of the loop extends laterally across the road in a direction perpendicular to a direction of travel along the road.

An orientation transverse to the road surface, is supported by the description at page 5, lines 6-8, is particularly defined in claims 1 and 4 as now amended, and is shown in applicant's Figs. 1 and 2. The claimed orientation of applicant's loop is neither disclosed or suggested in Hilliard.

In fact, Hilliard teaches away. In the official action, the examiner addresses claims 2 and 10 by asserting that Hilliard's coil as described at col. 6, lines 3-12 extends transversely across the road surface. The orientation in Hilliard is oblique, thus having a component that is transverse, but the plane of the coil is not oriented "perpendicular" to the direction of travel as particularly and distinctly defined in claim 1 as now amended. The examiner's comments suggest that the disclosure of a loop "at an angle to the direction of traffic flow" meets the claim limitation of extending in a direction perpendicular to the traffic flow. Reconsideration is requested in view of the amendment of claim 1 (and also claim 4, which recites a plurality of coils in a plane extending perpendicular to the direction of travel).

The coils in the cited passage of Hilliard are in a plane that is oriented 60 degrees offset from the direction of travel. They are not perpendicular. See col. 6, line 18. Thus the reference does not teach the subject matter of applicant's claims 1 and 4 as a whole.

Hilliard expressly teaches that an oblique or slanted angle of orientation has functional implications that depend on such an oblique orientation. By providing an oblique orientation for the coil, the wheels on each end of an axle of a vehicle cross the

coil at different times as the vehicle moves over the coil. This produces separate signal peaks for each such wheel. According to applicant's invention, the coil orientation is perpendicular. Both or all the wheels on a given axle cross at the same time.

Applicant's detection apparatus can provide distinctions in signal amplitude for one axle depending on the number of wheels that cross, but does not produce distinct countable peaks as in Hilliard. Hilliard specifically teaches an oblique orientation to produce a sequence of peaks. Hilliard thus teaches away from applicant's claimed invention.

Applicant's device, with a coil that is substantially perpendicular to the line of travel, produces a response in which the amplitude of the response varies with the number of wheels crossing at once. Thus applicant uses a different structure and function than Hilliard. Applicant's system has the capability to distinguish a four wheel axle from a two wheel axle. Hilliard does not. Hilliard's technique is to slant the coil so as to separate the signal peaks produced by wheels that are laterally spaced on a vehicle axle. The Hilliard coil is not configured to respond to two wheels that are laterally adjacent to one another on the axle. Hilliard's slanting coil would respond to laterally adjacent wheels by producing a peak that is wider than the peak of one wheel, but that signature would also be produced by a vehicle that has single wheels and is moving more slowly. The point is that applicant's claimed invention is structurally and functionally different from Hilliard. The differences are closely related to Hilliard's teachings of an oblique coil, thus demonstrating that Hilliard teaches away from applicant's invention. There is no basis to conclude that applicant's invention is known or obvious.

At col. 6, lines 12-13 of Hilliard, it is stated that by orienting the coil at a slant, each wheel of the vehicle is separately detectable. An orientation perpendicular to the direction of travel thus is seen to be unworkable to achieve the objects of Hilliard. Moving from Hilliard's oblique orientation to one perpendicular to the line of travel would "obscure some of the information available from the signature of a typical automobile"

because two wheels would cross the extended wire loop simultaneously. See col. 6, line 25. Hilliard expressly teaches away from the invention defined by applicant's claims 1 and 4.

The Hilliard technique of placing a coil along a slanting line may be advantageous for some forms of detection, wherein it is desired to count the number of axles of a vehicle. Except in the case of two or three wheeled motorcycles (which have a distinct signature of their own), one can assume with confidence that every axle of a vehicle such as a car or truck has at least one wheel on each end. It is not really necessary to check on whether a detected axle has a wheel on both ends. Having determined that an axle is present, the more important vehicle-classification criterion is whether the axle has two wheels or four (two on each end). Applicant's invention facilitates such a measurement. Hilliard's technique is not so effective because if axles have more than two wheels, the wheels on each end are very close together. A coil perpendicular to the direction of travel, as claimed by applicant, can distinguish vehicle signatures by the amplitude of the signal produced by all the wheels on a given axle, as opposed to the number of peaks. In Hilliard, the signatures of immediately adjacent wheels crossing an oblique coil would tend to merge and appear the same as a single wheel of a slow moving vehicle. Applicant can distinguish a four wheel axle from a two wheel axle, using a perpendicular coil that couples to all the wheels on an axle at once, in a manner that is not shown by Hilliard to be advantageous.

Inasmuch as Hilliard does not teach applicant's invention as defined in claim 1 as amended, no rejection is warranted on grounds of anticipation. Whereas Hilliard expressly teaches away from applicant's claimed orientation, there is no reason to believe that applicant's invention claimed as a whole would have been obvious. Therefore, claim 1 and the claims depending from claim 1 are properly allowable as now amended.

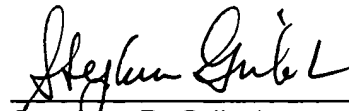
Claim 4 has been placed in independent form and recites a plurality of coil loops disposed in an array extending perpendicular to the direction of travel. Hilliard fails to teach or suggest the subject matter of claim 4. Claim 4 further distinguishes from Hilliard and is also allowable.

Claims 6 and 11 have already been indicated to contain allowable subject matter. These claims are now placed into condition for allowance by incorporation of the subject matter of the base and intervening claims.

The claims have been amended to particularly and distinctly define the subject matter regarded as the invention and to patentably distinguish over the prior art of record including the Hilliard reference that is now relied upon. The differences between the claimed invention and the prior art are such that the subject matter claimed, as a whole, would not have been known or obvious to a person of ordinary skill in the art. Reconsideration and allowance of pending claims 1 and 4-11 are requested.

Respectfully submitted,

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